

Prognostic value of coronary flow capacity assessed by coronary sinus flow obtained by phase contrast cine-magnetic resonance imaging in patients with acute coronary syndrome

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Background: The concept of coronary flow capacity (CFC) originated from positron emission tomography has been reported to provide prognostic information. Phase contrast cine-magnetic resonance imaging (PC-CMR) of the coronary sinus (CS) is a promising approach for quantifying global coronary sinus flow (CSF) and global coronary flow reserve (g-CFR) without the need for ionizing radiation, radioactive tracers, or intravascular catheterization.

Purpose: We evaluated the prognostic value of postprocedural CFC by quantifying CSF using PC-CMR in patients with acute coronary syndrome (ACS) treated with primary or urgent percutaneous coronary intervention (PCI).

Methods: This study prospectively but nonconsecutively enrolled 569 ACS patients who underwent uncomplicated primary (for ST-segment elevation myocardial infarction (STEMI)) or urgent PCI within 48 hours of symptom onset (for non-ST elevation acute coronary syndrome (NSTEMI-ACS)). Breath-hold PC-CMR images of CS were acquired to assess absolute CSF at rest and during maximum hyperemia within 30 days after culprit lesion PCI and revascularization of functionally significant non-culprit lesions. The entire cohort was stratified by the CFC according to the thresholds of hyperemic CSF and g-CFR. Impaired CFC was defined as a severely-reduced CFC in the present study. The association of CFC and baseline clinical characteristics with major adverse cardiac events (all-cause death,

nonfatal myocardial infarction, hospitalization for congestive heart failure or stroke) was investigated.

Results: In the final analysis of 502 patients (Male 417 (83.1%), mean age was 67 [58, 73]) and 310 patients (82.3%) with STEMI and 192 patients (38.2%) with NSTEMI-ACS were studied. In a total cohort, rest and maximal hyperemic CSF and corrected G-CFR were 0.93 [0.68, 1.24] ml/min/g, 2.08 [1.44, 2.77] ml/min/g, and 2.21 [1.58, 3.05], respectively. During a median follow-up of 28 months, MACE occurred in 53 patients (all-cause death: 19, nonfatal myocardial infarction: 16, late revascularization: 59, hospitalization for congestive heart failure: 9, stroke: 9). Cox proportional hazards analysis showed that corrected G-CFR and impaired CFC were both independent predictors of MACE. (hazard ratio (HR), 0.61, 95% confidence interval (CI): 0.45–0.82, $p=0.001$; HR, 3.51, 95% CI: 1.79–6.86, $p\leq 0.001$, respectively). Cardiac event-free survival was significantly worse in patients with impaired CFC (log-rank $\chi^2=22.9$, $P<0.001$). Net reclassification index (NRI) and integrated discrimination improvement (IDI) were both significantly improved when impaired CFC was added to the clinical risk model for predicting MACE.

Conclusions: In ACS patients successfully revascularized with primary or urgent PCI, CFC categorization stratified by noninvasive PC-CMR provided significant prognostic information independent of infarction size, conventional risk factors and g-CFR.